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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/057,124	01/24/2002	Guangrui Fu	10010858 -1	1851

7590 08/17/2004

HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
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EXAMINER	
MATTHEW, AARON D	
ART UNIT	PAPER NUMBER
2114	

DATE MAILED: 08/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/057,124	FU ET AL.	
	Examiner	Art Unit	
	Aaron D Matthew	2114	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01/24/2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 January 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *01/24/2002*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Information Disclosure Statement

1. The information disclosure statement filed 01/24/2002 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each U.S. and foreign patent; each publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered.

Specification

2. The disclosure is objected to because of the following informalities:
   - The first occurrence of the word, "other", on line 7, page 3, should be removed.
   - The first occurrence of the word, "gives", on line 20, page 4, should be removed.
   - The word, "for", on line 10, page 6, should be removed.
   - The word, "few", on line 22, page 9, should be replaced with "fewer".

   Appropriate correction is required.

3. Claims 1-25 have been examined, and are discussed below.

Claim Objections

4. Claims 7, 21 and 24 are objected to because of the following informalities:

- Regarding claim 7, the phrase, "adding a new duplicate processes," needs to be clarified. The examiner suggests replacing the phrase with one of the following options: "adding a new duplicate process," or "adding new duplicate processes," and will assume the former option in further treatment of the claim in the present action.
- Claim 21 is incorrectly labeled as being dependent on claim 1, when it is appears to the examiner that the claim is appropriately dependent on claim 17. The examiner will hereafter assume that claim 21 is dependent upon claim 17, as is represented in the language of the claim.
- Regarding claim 24, the phrase, "processes to transmit the external environment," should be changed to read, "processes to transmit to the external environment."

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1, 3, 4, 5, 7, 8, 12, 16, 17, and 19-22 are rejected under 35 U.S.C. 102(e) as being anticipated by Chung et al, (U.S. 6,195,760 B1).

Regarding claim 16, note Figure 2, and col. 3, lines 5-15, which discloses a data structure for memory failure recovery within a computer system, comprising the fields of:

- A primary process field, ("application module"), for identifying primary processes within the computer system; and
- A fault-tolerance variable field, ("degree of replication"), for identifying a predetermined number of duplicate processes, corresponding to the primary processes, to be maintained within the computer system.

Regarding claim 1, Chung et al discloses a method for memory failure recovery, comprising:

- Maintaining a predetermined number of duplicate and primary processes, (col. 1, lines 62-64);
- Keeping the processes in synchronization, (note col. 1, lines 62-67);

- Managing the processes so that a single process image is presented to an external environment, (see col. 1, lines 64-66; only the primary process is capable of presenting a process image to the external environment);
- Detecting a computer system exception which affects one of the processes, and terminating the affected process, (note col. 2, lines 39-41; a step of terminating a process is inherently included in a step of restarting a process).

Claim 17 is rejected based upon the same rationale applied to claim 1, above. Chung et al, in disclosing the method of claim 1 in a computer environment, inherently discloses a computer-usable medium embodying computer program code for commanding a computer to perform said method.

Claim 22 is rejected based upon the same rationale applied to claim 1 above. The functionality disclosed in the claims is identical.

Regarding claim 3, see col. 5, lines 36-42.

Claim 19 is rejected based upon the same rationale applied to claim 3. Chung et al, in disclosing the method of claim 3 in a computer environment, inherently discloses a computer-usable medium embodying computer program code for commanding a computer to perform said method.

Regarding claim 4, see col. 3, lines 6-15, wherein the maintaining element of claim 1 includes:

- Identifying a primary process, (lines 7-9);
- Monitoring a fault-tolerance value corresponding to the primary process, (lines 10-11; also, see Figure 2); and
- Setting a number of duplicate processes equal to the fault-tolerance value, (lines 14-15).

Claim 20 is rejected based upon the same rationale applied to claim 4. Chung et al, in disclosing the method of claim 4 in a computer environment, inherently discloses a computer-usable medium embodying computer program code for commanding a computer to perform said method.

Regarding claim 5, note, again, col. 3, lines 6-11, wherein it is disclosed that the registration message includes a predetermined fault-tolerance value. The monitoring element of, therefore, includes assigning a predetermined fault-tolerance value to a primary process.

Regarding claims 7 and 8, see col. 3, lines 22-31, and col. 4, lines 60-65. It is inherent that, if the total number of duplicate processes is to be maintained at an amount equal to the degree of replication, any additional duplicate processes beyond that amount must be deleted.

Regarding claim 12, note col. 1, lines 64-66, wherein only the primary process is capable of responding, (or transmitting), to an external environment.

Claim 21 is rejected based upon the same rationale applied to claim 12. Chung et al, in disclosing the method of claim 12 in a computer environment, inherently discloses a computer-usable medium embodying computer program code for commanding a computer to perform said method.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 2 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chung et al, and further in view of Tu et al, (U.S. 6,684,346 B2).

Regarding claim 2, Chung et al discloses a method for memory failure recovery, comprising:

- Maintaining a predetermined number of duplicate and primary processes, (col. 1, lines 62-64);
- Keeping the processes in synchronization, (note col. 1, lines 62-67);
- Managing the processes so that a single process image is presented to an external environment, (see col. 1, lines 64-66; only the primary process is capable of presenting a process image to the external environment);
- Detecting a computer system exception which affects one of the processes, and terminating the affected process, (note col. 2, lines 39-41; a step of terminating a process is inherently included in a step of restarting a process).

Chung et al fails to teach that the detecting element includes detecting a memory failure.

Tu et al teaches a fault-tolerant multiprocessing system in which multiple processes are synchronized in the event a memory failure is detected, (see col. 5, lines 9-12, and 25-27).

Chung et al and Tu et al are analogous art because they are from the same field of endeavor, viz., fault-tolerant, multiprocessor computer systems.

At the time of applicant's invention, it would have been obvious to include the capability of detecting memory failure conditions in the detecting step, in view of Tu et al. As is shown in Tu et al, and as would have been well known in the art, one of many conditions that could be hazardous to a system is a memory failure condition, (see, again, Tu et al, col. 5, lines 9-12). In a multiprocessor system, in particular, there is potential that a memory failure condition could affect the behavior of more than one process if the memory is shared. One of ordinary skill in the art would have been properly motivated to include detecting memory failures in the step of detecting a failure condition, in view of Tu et al, in order to prevent the corruption of one or more of the processes due to a memory failure condition.

Claim 18 is rejected based upon the same rational applied to claim 2. Chung et al, in view of Tu et al, in disclosing the method of claim 1 in a computer environment, inherently discloses a computer-usable medium embodying computer program code for commanding a computer to perform said method.

7. Claims 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chung et al, and further in view of Williams, (U.S. 6,247,143 B1), and Tu et al.

Regarding claim 23, Chung et al discloses a system for memory failure recovery, comprising:

- A primary process memory space hosting a primary process, (see Figure 1, element 101, in which primary process, A1, is located on computer, H1, and inherently hosted in a primary process memory space);
- A duplicate process memory space hosting a duplicate process corresponding to the primary process, (see Figure 1, element 102, in which duplicate process, A2, is hosted in a duplicate process memory space on computer, H2);
- Means for keeping the duplicate process in synchronization with the primary process, (col. 1, lines 60-67);

- A processor for generation an exception signal in response to detection of a failure condition which affects the primary process, (see col. 8, lines 41-45 and col. 2, lines 39-41); and
- An operating system for receiving the exception signal, terminating the affected primary process, and maintaining a predetermined number of primary and duplicate processes, (note, again, col. 2, lines 39-41; a step of terminating a process is inherently included in a step of restarting a process; also note col. 3, lines 24-31; it is inherent that there be an operating system present for performing these functions).

Chung et al fails to teach that said means for keeping the duplicate process in synchronization with the primary process is a synchronization buffer. Chung also fails to teach that said failure condition is a memory failure condition.

Williams teaches a multiprocessor computer system which provides fault tolerance for a number of duplicate processing sets, which are kept in synchronization by a synchronization buffer, (see Abstract).

Tu et al teaches a fault-tolerant multiprocessing system in which multiple processes are synchronized in the event of a memory failure, (see col. 5, lines 9-12, and 25-27).

Chung et al, Williams and Tu et al are analogous art because they are from the same field of endeavor, viz., fault-tolerant, multiprocessor computer systems.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the synchronization buffer of Williams as a means for keeping the duplicate process in synchronization with the primary process in Chung et al. The synchronization buffer allows for controlling and maintaining equivalent operation of the duplicate processing sets, (see col. 2, lines 43-48 in Williams). Chung et al teaches that the duplicate processes must run synchronously, (col. 2, lines 7-11), and one of ordinary skill in the art would, therefore, have considered it obvious and would have been properly motivated to combine the synchronization buffer of Williams in the fault tolerant system of Chung et al, as a means of controlling and maintaining the equivalent operation of duplicate processes.

It also would have been obvious to include capability of detecting memory failure conditions among the failure conditions in the detecting step, in view of Tu et al. As is shown in Tu et al, and as would have been well known in the art, one of many conditions that could be hazardous to a system is a memory failure condition, (see, again, Tu et al, col. 5, lines 9-12). In a multiprocessor system, in particular, there is potential that a memory failure condition could affect the behavior of more than one process if the memory is shared. One of ordinary skill in the art would have been properly motivated to include detecting memory failures in the step of detecting a

failure condition, in view of Tu et al, in order to prevent the corruption of one or more of the processes due to a memory failure condition.

Regarding claim 24, Chung et al fails to teach a buffer controller for permitting the processes to receive communications from an external environment while permitting only one of the processes to transmit to the external environment.

Williams teaches a buffer controller, (see Figure 3, element 50), for permitting the processes to receive communications from an external environment, (see col. 2, lines 43-48), while permitting only one of the processes to transmit to the external environment, (see Abstract, "selective forwarding").

Chung et al teaches that the backup processes should not be able to respond to the external environment, but should be capable of receiving communications from the external environment through some means, (col. 1, lines 64-67). One of ordinary skill in the art at the time of applicant's invention would have clearly recognized that the buffer controller disclosed in Williams offers a means of forwarding communications from the external environment to all duplicate processes, while selectively enabling only a primary process to communicate to the external environment. It would have been obvious to one of ordinary skill in the art to include the buffer controller of Williams in the system disclosed in Chung et al, in order to

ensure proper communication between the external environment and the duplicate processes.

Regarding claim 25, Chung et al fails to teach that the exception signal is a machine check abort signal.

Tu et al teaches, (col. 5, lines 9-12), that the exception signal generated upon detection of a memory error is a machine check abort signal.

At the time of applicant's invention, one of ordinary skill in the art would have considered it obvious to use a machine check abort signal upon detection of a memory failure condition. Tu et al teaches that a machine check abort exception should occur in a processor when an error condition arises that requires corrective action, (see col. 1, lines 36-38). Tu et al also teaches that a memory error condition qualifies as a condition requiring corrective action, (col. 5, lines 9-12). One of ordinary skill in the art at the time of applicant's invention, in view of Tu et al, would, therefore, have considered it obvious to use a machine check abort signal upon detection of a memory failure, and would have been motivated to do so in order to facilitate corrective action.

8. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chung et al as applied to claim 1 above, and further in view of Williams.

Chung et al teaches synchronizing the processes, (col. 2, lines 9-11), but fails to explicitly teach that the processes are synchronized upon transmission by one of the processes to an external environment.

Williams teaches a multiprocessor computer system which provides fault tolerance for a number of duplicate processing sets, in which the duplicate processes are synchronized upon transmission by one of the processes to an external environment, (see Abstract).

At the time of applicant's invention, it would have been obvious to one of ordinary skill in the art to include the means of synchronization taught by Williams for synchronizing the duplicate processes disclosed in Chung et al. By monitoring the outputs of the duplicate processes and synchronizing the processes upon receipt of the outputs, the system is able to synchronize the operation of processes that might otherwise operate asynchronously, (see col. 1, lines 39-43 in Williams). One of ordinary skill in the art would have considered it obvious and would have been properly motivated to combine synchronizing the processes upon transmission by one of the processes to an external environment, in the method disclosed by Chung

et al, in order to enable the synchronization of processes that otherwise operate asynchronously.

9. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chung et al as applied to claim 1 above, and further in view of Jewett et al, (U.S. 6,263,452 B1).

Regarding claims 9 and 10, Chung et al teaches synchronizing the processes, (col. 2, lines 9-11), but fails to teach that the processes are synchronized upon receipt of data or receipt of signals from an external environment.

Jewett et al teaches a fault-tolerant computer system with redundant components that are synchronized upon detecting events such as memory references, (see col. 2, lines 46-49). A memory reference event entails the receipt of data and the receipt of a signal.

Chung et al and Jewett et al are analogous art because they are from the same field of endeavor, viz., fault-tolerant computer systems with redundantly operating components.

One of ordinary skill in the art at the time of applicant's invention would have considered it obvious to perform the step of synchronizing the duplicate processes upon receipt of a signal or data. One of ordinary skill in the art would have clearly recognized that synchronizing redundant processes upon receipt of data is a simple means of ensuring that all processes execute a given function simultaneously, (see Williams, col. 2, lines 46-49). Any time a signal or data is received by a process, there is potential for the state of the process to be altered. One of ordinary skill in the art would have been properly motivated to synchronize duplicate processes upon the receipt of data or a signal, in order to coordinate the processes and ensure that any change of state occurs simultaneously between the processes.

10. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chung et al as applied to claims 1 and 4 above, and further in view of Hayden, (U.S. 2003/0061530 A1).

Regarding claim 6, Chung et al fails to teach that the monitoring element includes dynamically modifying the fault-tolerance value of the primary process, in response to a computer command.

Hayden teaches a redundant component system in which a monitoring element dynamically modifies a fault-tolerance value, ("redundant component quantity"), of the primary process, in response to a computer command, (see paragraph 0008).

Chung et al and Hayden are analogous art because they are from the same field of endeavor, viz., redundant component systems with variable levels of redundancy for a given component.

One of ordinary skill in the art at the time of applicant's invention would have considered it obvious to include capability to dynamically modify a fault-tolerance value of a primary process, as taught in Hayden, to the system disclosed by Chung et al. Should the needs of the system change during processing, the addition of dynamically modifying the fault-tolerance value of a primary process ensures that a minimum level of redundancy is provided for the process that will maintain fault-tolerant reliability, and conserve system resources, (see paragraphs 0008 and 0034). One of ordinary skill in the art would have been properly motivated to include the capability of dynamically modifying the fault-tolerance value of a primary process based on system data, as taught in Hayden, to the methods disclosed in Chung et al, in order to conserve system resources and maintain a proper level of redundancy at all times.

11. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chung et al as applied to claim 1 above, and further in view of official notice.

Regarding claims 13 and 14, it has already been shown that Chung et al teaches that only one of the process is permitted to transmit to an external environment.

Chung et al fails to teach that only one of the processes is permitted to perform a system call or a library call to an external environment.

Examiner takes official notice that many possible types of transmission between a process and an external environment, including system and library calls, would have been well known in the art at the time of applicant's invention.

At the time of applicant's invention, it would have been obvious to one of ordinary skill in the art to include system calls and library calls among the types of transmissions that only one of the processes would be permitted to send to an external environment. In order for a process to be able to communicate properly with an external environment, it may be necessary to perform a system call or a library call. As both types of transmission would have been well known in the art, one of ordinary skill in the art would have been properly motivated to include system calls and library calls among the types of transmissions only one process would be

permitted to send, in the method disclosed in Chung et al, in order to enable proper and thorough communication between said process and the external environment.

12. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chung et al, and further in view of official notice.

Chung et al teaches a method for failure recovery, comprising:

- Maintaining a predetermined number of duplicate and primary processes, (col. 1, lines 62-64);
- Keeping the processes in synchronization, (note col. 1, lines 62-67);
- Managing the processes so that a single process image is presented to an external environment, (see col. 1, lines 64-66; only the primary process is capable of presenting a process image to the external environment);
- Detecting a computer system exception which affects one of the processes, and terminating the affected process, (note col. 2, lines 39-41; a step of terminating a process is inherently included in a step of restarting a process).

Wherein the maintaining element includes:

- Identifying a primary process, (lines 7-9);
- Monitoring a fault-tolerance value corresponding to the primary process, (lines 10-11; also, see Figure 2); and

- Setting a number of duplicate processes equal to the fault-tolerance value, (lines 14-15).

Wherein the managing element includes:

- Permitting only one of the processes to transmit to an external environment, (note col. 1, lines 64-66).

Chung et al fails to teach that the managing element includes permitting only one of the processes to perform a system call to an external environment.

Examiner takes official notice that many possible types of transmission between a process and an external environment, including system calls, would have been well known in the art at the time of applicant's invention.

At the time of applicant's invention, it would have been obvious to one of ordinary skill in the art to include system calls among the types of transmissions that only one of the processes would be permitted to send to an external environment. In order for a process to be able to communicate properly with an external environment, it may be necessary to perform a system call. As this type of transmission would have been well known in the art, one of ordinary skill in the art would have been properly motivated to include system calls among the types of transmissions only one process would be permitted to send, in the method disclosed in Chung et al, in order

to enable proper and thorough communication between said process and the external environment.

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Brittain et al, (U.S. 6,684,396 B1), teaches a fault-tolerant system in which the number of backup copies of a software process is temporarily and dynamically increased during a software upgrade.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron D Matthew whose telephone number is (703) 605-1211. The examiner can normally be reached on Mon-Fri, from 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert W Beausoliel can be reached on (703) 305-9713. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Aaron D Matthew
Examiner
Art Unit 2114

ADM

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